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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,976	04/02/2004	Atsushi Fukui	900-495	7726

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ARLINGTON, VA 22203

EXAMINER

TRINH, THANH TRUC

ART UNIT	PAPER NUMBER
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1795

MAIL DATE	DELIVERY MODE
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01/28/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/815,976

Applicant(s)

FUKUI ET AL.

Examiner

Thanh-Truc Trinh

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 10-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/ are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>11/05/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-4 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Lupo et al. (US Patent 5885368)

Regarding claims 1-4 and 7, as seen in Figure 1, Lupo et al. disclose a dye-sensitized solar cell comprising a transparent conductive layer (11), a porous semiconductor of titanium oxide (12) on which a dye sensitizer is adsorbed, a carrier transport layer (14) and an counter electrode (15) which are formed in this order on a transparent substrate (16). (See col. 2 lines 30-57). The dye sensitizer is made of metal complex dye such as cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylate)-ruthenium(II) (See formula VIII). Lupo et al. also describe that the absorbance peak of the porous semiconductor layer after being rinsed with ethanol and dried in a warm air stream is 500 nm. (See col. 26 lines 58-67 bridging col. 27 lines 1-3, or col. 27 lines 40-52).

Regarding the limitation of "the absorbance peak of the porous semiconductor layer is located on a shorter wavelength side of the absorbance spectrum than that of the porous semiconductor layer observed immediately after

the dye sensitizer is adsorbed", Applicant's disclosure states that this limitation is the result of thermal treatment. (Specification, Page 13). Lupo et al. describe the dye-sensitized semiconductor is subjected to a warm air stream, (See col. 26 lines 58-67 bridging col. 27 lines 1-3, or col. 27 lines 40-52), therefore the Examiner considers that the reference reads on the limitation.

2. Claims 1-4 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshikawa (PGPub 20020040728)

Regarding claims 1-4 and 7, as seen in Figure 1, Yoshikawa discloses a dye-sensitized solar cell comprising a transparent conductive layer (10), a porous semiconductor of titanium oxide (20) on which a dye sensitizer (22) is adsorbed, a carrier transport layer (30) and an counter electrode (40) which are formed in this order on a transparent substrate (50). (See paragraphs [0069] and [0074]-[0111]). The dye sensitizer is made of metal complex dye such as cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato)-ruthenium (II). (See formula III and R-1 in paragraph [0111]).

Regarding the limitation of "the absorbance peak of the porous semiconductor layer is located on a shorter wavelength side of the absorbance spectrum than that of the porous semiconductor layer observed immediately after the dye sensitizer is adsorbed", Applicant's disclosure states that this limitation is the result of chemical treatment. (Specification, Pages 13-15). Yoshikawa describes that the dye-sensitized semiconductor is subjected to a chemical treatment with heteroatom-containing compounds such as tetrahydrofuran,

imidazole, etc., to improve the efficiency, (See paragraphs [0027]-[0067]),
therefore the Examiner considers that the reference reads on the limitation.

Since Yoshikawa discloses all the structural and material limitations of the instant claims, it is the Examiner's position that the absorbance peak of the porous semiconductor layer is inherently located within the range of $500 \text{ nm} \pm 30 \text{ nm}$.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
3. Claims 5-6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lupo et al. (US Patent 5885368) in view of Andriessen et al. (WO 2004/025748).

Regarding claims 5-6 and 8-9, Lupo et al. disclose a dye-sensitized solar cell as described in claim 1 or 2.

Lupo et al. do not explicitly disclose the dye sensitizer is made of cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato)-ruthenium(II)bis-tetrabutylammonium, tris(isothiocyanato)-ruthenium(II)-2,2':6',2"-terpyridine-4,3',4"-tricarboxylic acid, tris-tetrabutylammonium salt.

Andriessen et al. disclose the dye sensitizer is made of cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato)-ruthenium(II)bis-tetrabutylammonium, or tris(isothiocyanato)-ruthenium(II)-2,2':6',2"-terpyridine-4,3',4"-tricarboxylic acid. (See table on page 18).

Relevant to claims 6 and 9, in regards to formula (1), Applicant's disclosure states that the formula is of Ruthenium 620-1H3TBA commercialized by Solaronix, Swiss (Specification, Page 12 paragraph 2). Andriessen et al. teach using Ruthenium 620 as a dye sensitizer in solar cell (see table on page 18 of Andriessen et al.). Also, a MSDS of Ruthenium 620-1H3TBA from Solaronix is provided to support the fact that this compound has been commercialized before the time the invention was made. Thus, the Examiner considers the reference teaches the instant limitation:

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Lupo et al. by specifically using the dye sensitizers as taught by Andriessen et al., because it would allow a broad absorption. (See page 17 of Andriessen et al.).

In such a combination, the absorbance peak of the porous semiconductor layer is inherently located within the range of $490\text{ nm} \pm 35\text{nm}$, or $580\text{ nm} \pm 35\text{ nm}$.

4. Claims 5-6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa (PGPub 20020040728) in view of Andriessen et al. (WO 2004/025748).

Regarding claims 5-6 and 8-9, Yoshikawa discloses a dye-sensitized solar cell as described in claim 1 or 2.

Yoshikawa discloses the general formula of ruthenium dye sensitizer, but does not specifically list out cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato)-ruthenium(II)bis-tetrabutylammonium or tris(isothiocyanato)-ruthenium(II)-2,2':6',2''-terpyridine-4,3',4''-tricarboxylic acid, tris-tetrabutylammonium salt.

Andriessen et al. disclose the dye sensitizer is made of cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato)-ruthenium(II)bis-tetrabutylammonium and tris(isothiocyanato)-ruthenium(II)-2,2':6',2''-terpyridine-4,3',4''-tricarboxylic acid. (See table on page 18).

Relevant to claims 6 and 9, in regards to formula (1), Applicant's disclosure states that the formula is of Ruthenium 620-1H3TBA commercialized by Solaronix, Swiss (Specification, Page 12 paragraph 2). Andriessen et al. teach using Ruthenium 620 as a dye sensitizer in solar cell (see table on page 18 of Andriessen et al.). Also, a MSDS of Ruthenium 620-1H3TBA from Solaronix is

provided to support the fact that this compound has been commercialized before the time the invention was made. Thus, the Examiner considers the reference teaches the instant limitation.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Yoshikawa by applying dye sensitizers as taught by Andriessen et al., because it would allow a broad absorption. (See page 17 of Andriessen et al.).

In such a combination, the absorbance peak of the porous semiconductor layer is inherently located within the range of $490\text{ nm} \pm 35\text{nm}$, or $580\text{ nm} \pm 35\text{ nm}$.

Response to Arguments

Applicant's arguments filed 11/05/2007 have been fully considered but they are not persuasive.

Applicant argues that the absorbance peak of the porous semiconductor layer of the present invention shifted to a shorter wavelength side of the absorbance spectrum (such as $500\text{ nm} \pm 30\text{ nm}$ as claimed in claim 4) is a result of a technique such as thermal treatment. Applicant also argues that the thermal treatment (warm air) of Lupo does not achieve the shifting in wavelength, and the description "about 500 nm" of Lupo is an approximate (inaccurate) value as the evidences provided by the Applicant show that the absorbance peak of the dye is 534-535nm. However, Applicant's argument is not persuasive. First of all, "a technique" is deemed to be a method, which is not part of claimed limitation.

Secondly, Lupo teaches all the structural limitations, the type of dye (Ruthenium dye), the absorbance of "about 500 nm" which is exactly another way to describe "500 nm \pm 30nm", and even the thermal treatment such as warm air. Therefore Lupo teaches all the limitations, and the rejection is maintained.

Applicant further argues "not all chemical treatments as disclosed in Yoshikawa shift the absorbance peak of a dye absorbed thereby to a shorter wavelength". The Examiner respectfully disagrees. As explained in the rejection above, Yoshikawa teaches all the structural limitations, material limitations and chemical treatments after the dye is adsorbed to the semiconductor as disclosed by the Applicant. Therefore it is the Examiner's position that Yoshikawa teaches the shift in absorbance peak of the semiconductor layer to a shorter wavelength side.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will

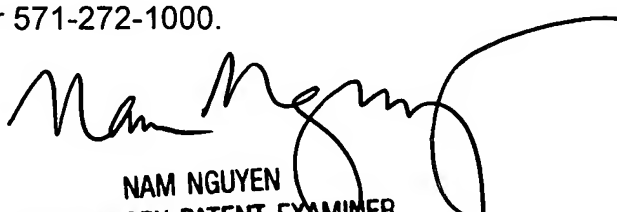
the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT
01/15/2008


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